

CLAIMS

We claim:

1. A method of producing a heat set plastic container comprising the steps of:
providing a plastic preform within a mold cavity;
expanding and stretching the preform into conformity with surfaces defining the mold cavity;
mixing a high-temperature gas with a fluid such that the heat transfer coefficient of the high-temperature gas and fluid mixture is greater than the heat transfer coefficient of the high-temperature gas alone; and
circulating the high-temperature gas and fluid mixture through the interior of the plastic container to induce crystallinity in the plastic container.
2. The method of Claim 1 wherein said mixing step includes mixing the high-temperature gas with a fluid in liquid state and at ambient temperature and pressure.
3. The method of Claim 1 wherein said mixing step includes mixing the high-temperature gas with water.
4. The method of Claim 1 wherein said mixing step includes atomizing the fluid into the high-temperature gas.
5. The method of Claim 1 wherein said mixing step includes vaporizing the fluid into the high-temperature gas.

6. The method of Claim 1 further comprising the steps of mixing a low-temperature gas with a second fluid such that the heat transfer coefficient of the low-temperature gas and a second fluid mixture is greater than the heat transfer coefficient of the low-temperature gas alone; and circulating the low-temperature gas and second fluid mixture through the interior of the plastic container to cool the plastic container.

7. The method of Claim 6 further comprising the step of providing the fluid and the second fluid from a common source.

8. The method of Claim 6 wherein said second mixing step includes mixing the low-temperature gas with a second fluid in liquid state and at ambient temperature and pressure.

9. The method of Claim 6 wherein said mixing step includes mixing the low-temperature gas with water.

10. The method of Claim 6 wherein said second mixing step includes atomizing the second fluid into the low-temperature gas.

11. The method of Claim 6 wherein said second mixing step includes vaporizing the second fluid into the low-temperature gas.

12. The method of Claim 1 wherein said mixing step includes mixing a high-temperature gas that includes air.

13. The method of Claim 1 wherein said mixing step includes mixing a high-temperature gas that has a temperature in the range of 200°C to 400°C.

14. The method of Claim 1 wherein said mixing step includes mixing a high-temperature gas that is at a pressure in the range of 100psi to 600psi.

15. The method of Claim 1 wherein said mixing step includes mixing the high-temperature gas for a duration in the range of 1 second to 15 seconds.

16. The method of Claim 1 wherein said circulating step is performed while the plastic container remains within the mold cavity.

17. A blow molding machine for producing a heat set container, said machine comprising:

a blow mold defining a mold cavity capable of receiving a preform;

a high-pressure gas source to supply a high-pressure gas;

a high-temperature gas source to supply a high-temperature gas;

a fluid source to supply a fluid;

a mixer coupled to said high-temperature gas source and to said fluid source to mix the high-temperature gas with the fluid;

a blow core assembly engagable with the preform and coupled to said high-pressure gas source, to said high-temperature gas source, and to said fluid source, said blow core assembly also having an exhaust; and

a controller coupled to said high-pressure gas source, to said high-temperature gas source, and to said fluid source, whereby said controller controls the providing of the high-pressure gas into the preform to blow mold the preform into a container, and controls the mixing of the fluid with the high-pressure gas into a mixture such that the heat transfer coefficient of the mixture is greater than the heat transfer coefficient of the high-temperature gas alone, and controls the providing of the mixture to an interior portion of the container to induce crystallinity into the container, and controls the exhausting of the mixture through said exhaust.

18. The blow molding machine of Claim 17 wherein said fluid source supplies fluid in a liquid state and at ambient temperature and pressure.

19. The blow molding machine of Claim 17 wherein said fluid source supplies a fluid that includes water.

20. The blow molding machine of Claim 17 wherein said mixer includes an atomizer.

21. The blow molding machine of Claim 17 wherein said mixer includes a vaporizer.

22. The blow molding machine of Claim 17 wherein said high-pressure gas source supplies a high-pressure gas at a pressure in the range of 100psi to 600psi.

23. The blow molding machine of Claim 17 wherein said high-temperature gas source supplies a high-temperature gas at a temperature in the range of 200°C to 400°C.

24. The blow molding machine of Claim 17 further comprising a low-temperature gas source to supply a low-temperature gas, and a second mixer coupled to said low-temperature gas source and to said fluid source to mix the low-temperature gas with the fluid, said controller further coupled to said low-temperature gas source, whereby said controller controls the mixing of the fluid with the low-temperature gas into a second mixture such that the heat transfer coefficient of the second mixture is greater than the heat transfer coefficient of the low-temperature gas alone, and controls the providing of the second mixture to an interior portion of the container to cool the container.